



The Co-operative University of Kenya
END OF SEMESTER EXAMINATIONS APRIL-2019

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
STATISTICS WITH IT / BACHELOR OF COMPUTER SCIENCE (YR I SEM II)

UNIT CODE: BSTA 1203

UNIT TITLE: PROBABILITY AND STATISTICS I

DATE: 25TH APRIL, 2019

TIME: 2:00 PM – 4:00 PM

INSTRUCTIONS:

Answer question **ONE (compulsory)** and any other **TWO** questions **Question one**

QUESTION ONE

(a) What is sampling? Distinguish between probability and non-probability sampling.

(3 marks)

(b) The frequency distribution table represents data collected by a pollster on profit (in thousands of dollars) made by 100 branches of a certain company ;

Class	9352-9357	9358-9363	9364-9369	9370-9375	9376-9381	9382-9387
Frequency	6	15	39	24	10	6

Using coding formula, obtain the mean and standard deviation of this distribution (5 marks)

(c) Briefly explain the difference between skewness and kurtosis hence illustrate graphically the three types of skewness and the three types of kurtosis (5 marks)

(d) In a study to determine whether the length of time a person has been employed with a company (a proxy for experience X months) is related to how much the person is paid (compensation Y dollars) the following data was obtained. Obtain the Spearman's rank

correlation coefficient $r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$ and interpret it (4 marks)

Employee's Initials	J.K	S.T	K.L	J.C	R.W	Z.H	K.Q	W.D	D.Q	JB
Compensation (Y \$/hr)	5	15	18	20	25	25	30	34	38	50
Length of employment (X months)	42	32	37	33	24	29	26	22	24	15

(e) The following table shows the frequency distribution of the diameters of 50 bottles. (Lengths have been measured to the nearest millimetre). Obtain the quartile deviation and the coefficient of quartile deviation for this data (5 marks)

Class	35-39 mm	40-44 mm	45-49 mm	50-54 mm	55-59 mm
Frequency	6	12	15	10	7

- (f) Suppose that $P(A') = 0.6$, $P(B) = 0.5$ and $P(A' \cup B') = 0.8$ Find; $P(A \cup B)$, $P(AB')$ and $P(A/B')$ (3 marks)
- (g) The probability distribution of a random variable X is as below. Find the mean and standard deviation of;
- i). X
- ii). $12X + 6$. (5 marks)

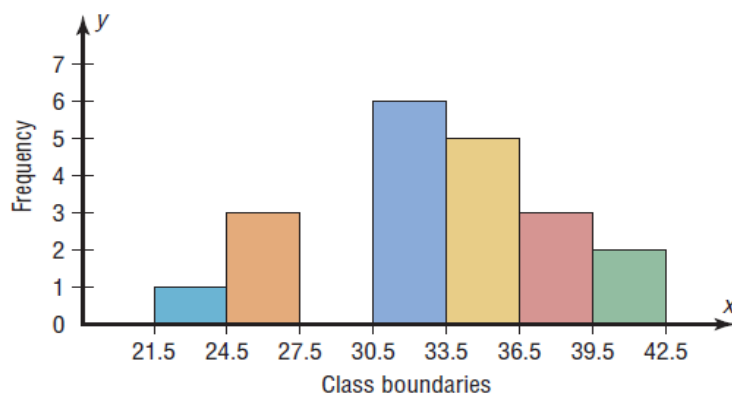
X	0	1	2
$P(X=x)$	1/6	1/2	1/3

QUESTION TWO

- (a) Marks obtained by 94 students in a physics test were as tabulated below. If the mode mark is estimated to be 45.5, determine the values of a and b . Take the modal class as 40-59. (6 marks)

Class	0-19	20-39	40-59	60-79	80-99
frequency	11	A	30	B	13

- (b) Using a calculator, determine the mean and standard deviation of the data 31 35 29 36 25 29 48 46 28 47 42 hence find;
- i) The coefficient of variation C.V (X) (3 marks)
- ii) The moment coefficient of skewness $\alpha_3 = \frac{\sum (x - \bar{x})^3}{ns^3}$. and interpret it (3 marks)
- (c) Using the histogram shown here, Construct a frequency distribution; include class limits, class frequencies, midpoints, and cumulative frequencies. How many values fall between 24.5 and 36.5 and how many values are above 33.5? (5 marks)



- (d) At a school fair, visitors enter a 'Guess the weight of the cake' competition. Their guesses, rounded to the nearest 100 grams, were recorded in the following table:

Guess (kg)	10.5 - 10.7	10.8 - 11.0	11.1 - 11.3	11.4 - 11.6	11.7 - 11.9
Frequency	5	32	26	11	6

Find the geometric and harmonic mean of the guessed weight (3 marks)

QUESTION THREE

- (a) The table below gives the annual advertising budgets (\$'000) and the yearly profit increases (%) of 8 companies are shown below

Annual advertising budget (\$'000)	11	14	15	17	20	25	25	27
Yearly profit increase (%)	2.2	2.2	3.2	4.6	5.7	6.9	7.9	9.3

- i. Using a calculator, obtain the correlation coefficient and fit a least squares regression line. . (3 marks)
 - ii. Comment on the correlation of the advertising budget and profit increase (%). (1 mark)
 - iii. Calculate the coefficient of determination and interpret it (2 mark)
 - iv. What would be the yearly profit increases (%) correct to 1 decimal place if the annual advertising budgets goes up to \$30,000 (1 mark)
- (b) The table below gives data relating the percentage of lectures attended by students in a semester and the corresponding mark for each student in the exam for that subject

X=Lectures attended (%)	70	59	85	93	78	85	84	69	70	82
Y=Exam result (%)	80	62	89	98	84	91	83	72	75	85

- i) Calculate the Pearson's product moment correlation coefficient

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \times \sqrt{n \sum y^2 - (\sum y)^2}} \quad (8 \text{ marks})$$

- ii) Calculate the coefficient of determination. What does this statistic mean? (1 marks)

- (c) Given the probability distribution of a discrete random variable Y as below, determine the value of the constant c hence find the mean and standard deviation of Y (4 marks)

y	0	1	2	3	4
P(Y=y)	c	2c	5c	10c	17c

QUESTION FOUR

- (a) The random variable Z has the probability distribution shown below,

z	2	3	5	7	11
P(Z=z)	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{4}$	x	y

If $E(Z) = 4\frac{2}{3}$, find the values of x and y. (5 marks)

- (b) Let A and B be two events such that $p(A \cup B) = \frac{3}{4}$, $p(A') = \frac{2}{3}$ and $p(AB) = \frac{7}{30}$ find the odds of even A, $p(AB')$ and $p(A/B')$ (5 marks)
- (c) Suppose $P(A/B) = 0.4$, $P(A/B') = 0.8$ and $P(B) = 0.5$ Find $P(B/A)$ (4 marks)
- (d) Distinguish between; mutually exclusive events and independent events hence given two events A and B such that $P(A) = 0.4$ while $P(A \cup B) = 0.7$, find $P(B)$ if A and B are ;
- i) mutually exclusive events (3 marks)
 - ii) independent events (3 marks)

